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ITASCA STATE PARK

PINE RESTORATION PROJECT

Short Project Description

Prepared for the Department of Natural Resources

Division of Parks and Recreation

by

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The Pine Restoration Project for Itasca State Park arose out of long concern over the deterioration of the very amenities the establishment of the park was meant to preserve. Concern about attrition to the seral pine communities and the scarcity of young pine stands was voiced almost from the park's inception in 1891. In earlier years some planting was attempted with only partial success.

Today less than a fifth of the park's acreage is mapped as pine. This is far less than existed in pre-settlement times (Figures 1a and 1b). Logging, frequent and intense fires of the settlement and logging periods, subsequent fire suppression, the buildup of excessive populations of porcupine and deer as a result of predator control and prohibition of deer hunting, and introduction of white pine blister rust have all discriminated against the pine types and their reproduction in the park. Of the surviving pine stands one-half of the red pine (Pinus resinosa) and more than eighty-five per cent of the white pine (Pinus strobus) are over 200 years old and subject to heavy mortality. The once common jack pine (Pinus banksiana) type, ecologically fire-dependent, is now reduced to only a few small stands. Because of the short life expectancy of jack pine, the remaining stands are now literally falling apart. Overmature trees are more subject to insect attack, disease, and windthrow. Research has demonstrated that attrition of the old growth pine is accelerating.[1]

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[1]For a more detailed discussion of the ecological trends of Itasca vegetation the reader is referred to "The Ecology of Upland Forest Communities and Implications for Management in Itasca State Park, Minnesota," Univ. of Mn. Ag. Exp. Sta. Bull. 298, 1974.

as reconstructed from the general vegetation descriptions in the field notes of the land survey, 1875-1879 (after Frissell, 1971).

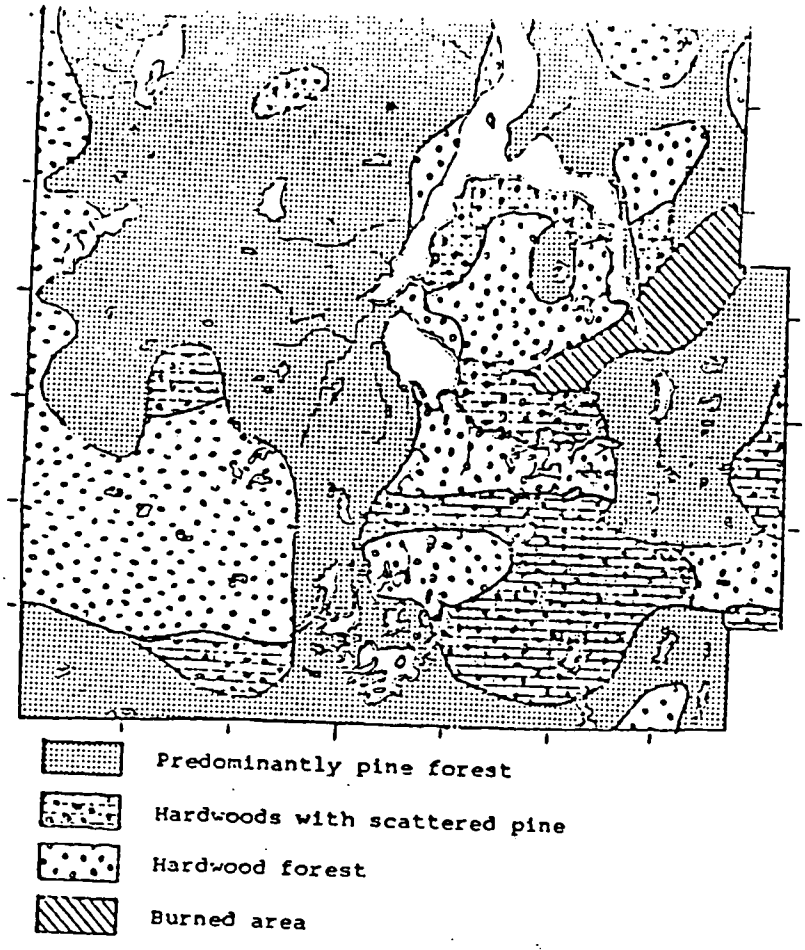
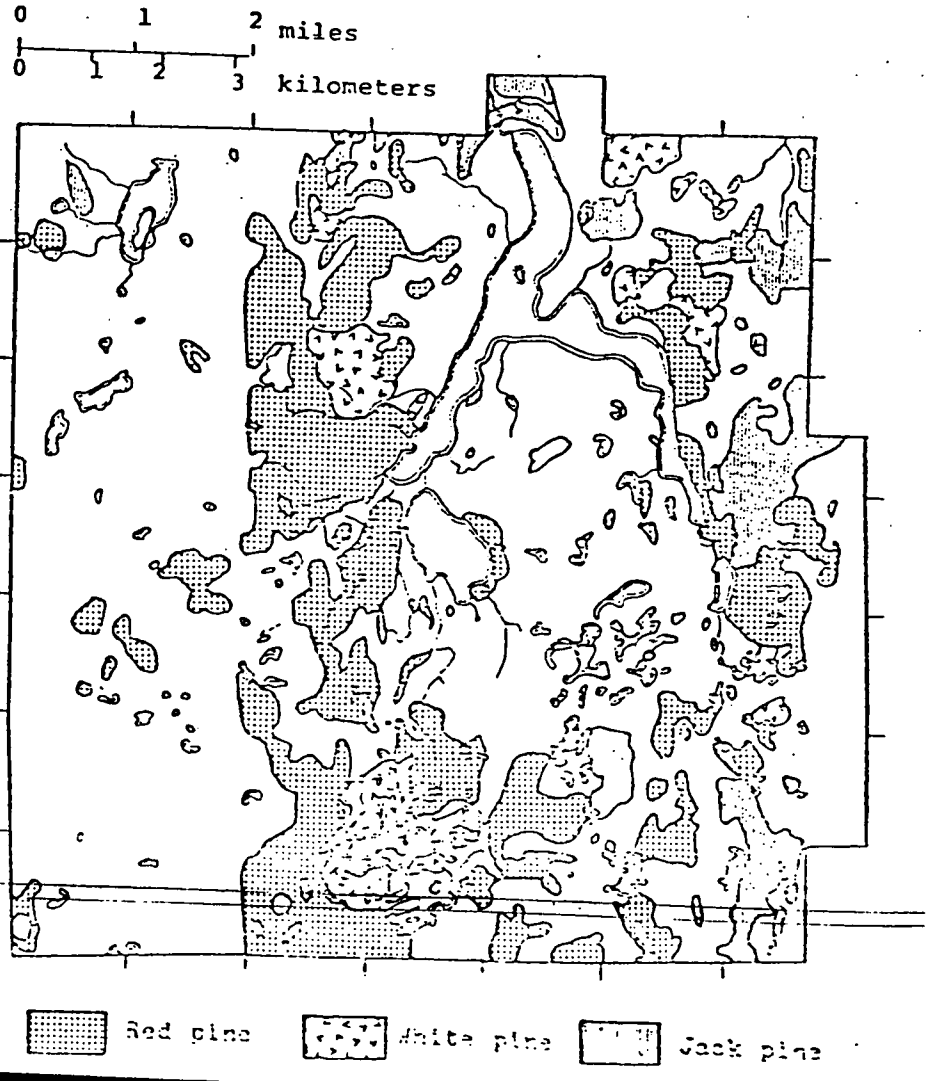


Figure 1b. Here is the distribution of pine forest in Itasca State Park in 1966 (after Meyer, 1966 and Frissell, 1971).



A long history of research and cooperative monitoring of the park's vegetational status led to a joint proposal by the University of Minnesota College of Forestry and the Minnesota Department of Natural Resources to restore pine forest to certain areas within the park. In 1964 a major research project was initiated:

1. To investigate the history of the park's vegetation;
2. To examine present forest stands to determine species and types, their ages, conditions, regeneration patterns, and other characteristics;
3. To determine future changes resulting from ecological succession under present protection management;
4. To evaluate park users' preferences and reactions to various management activities such as burning, logging, use of herbicides and planting, and the resultant administrative problems created;
5. To investigate the possibilities of recreating the pre-white man forest. (Hansen, 1974)

Most aspects of this project have now been completed. S. S. Frissell did an exhaustive work on the fire history of the park in 1968. Norman Aaseng documented the logging history for the area within the present park boundaries. M. P. Meyer prepared a cover type map for the park from 1966 aerial photographs. Visitor preferences and reaction to active vegetation manipulation were surveyed by Klukas, Duncan and McCool. H. L. Hansen and others have established fourteen experimental areas testing various management techniques for the restoration of pine.

In recognition of the different management objectives appropriate to different areas of the park, a plan for dividing the park into six management zones, with different management goals for each zone, has been developed (Figure 2). The Pine Restoration Project described here is located in Zone 5, the Developmental Management Zone. In 1976 the Department of Natural Resources researchers made an intensive study of this area with the following objectives:

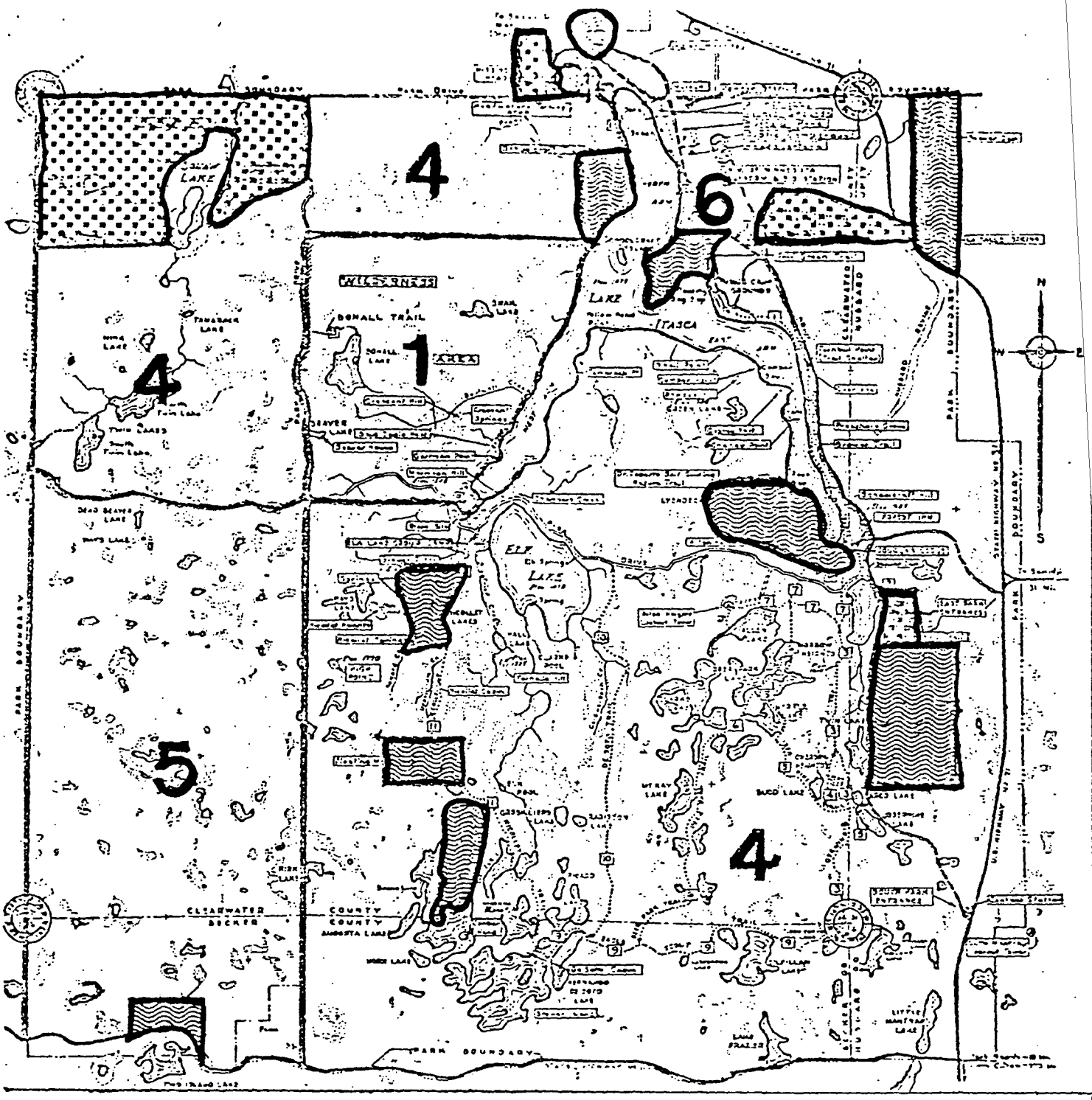


Figure 2.

Itasca State Park Management Zones,

Provisionally recommended June 26, 1970

1. Mapping of the old growth pine forest by examining cut stump patterns and densities;
2. Identifying sensitive areas where vegetation or wildlife values might be irrevocably altered by active treatment;
3. Delineation of northern hardwood areas;
4. Mapping of old logging roads, lumber camps, cabins, and other historic areas;
5. Vegetation analysis;
6. Location of natural fire barriers;
7. Delineation of fifteen treatment units.

The Developmental Management Zone has been identified as having had the greatest disturbance. It was annexed to the park after being almost completely cut over and repeatedly burned. Consequently, the original pine areas in the zone converted to aspen, birch, brush, and other transient types. It is hoped that the application of ecological knowledge and management techniques tested over the past 25 years will restore this zone to its pre-settlement condition as faithfully as possible.

Treatment Units

There are fifteen treatment units, one for each of the 15 years of the management plan. (Figure 3) Unit number 9 is divided into two sub-units 9A and 9B. It was originally thought that each of these sub-units would have unit status but the small treatable acreage in this area suggested the fusion of the two.

The unit boundries were designed to follow natural fire breaks: slopes, ridges, lakes and swamps. The units were, as near as possible, made equal in size (in terms of treatable acreage).

Prior to the establishment of the unit boundries several areas were excluded from treatment either to leave the existing community structure as it has developed or to protect sensitive plants or wildlife areas. These areas are indicated with a slant hatching in Figure . Exclusion from treatment does not mean that fire should be forever excluded from such areas. The exclusion zone on the east border of the Project area, in section 32, was established as a buffer zone for a heron rookery at Kirk Lake. The red tinted areas in figure one are sensitive areas from which treatment is to be excluded. These areas were located and delineated by the 1976 research team with the help of the Department of Natural Resources Division of Forestry cruisers. The criteria for the establishment of an exclusion areas were:

1. areas with rare or sensitive plants or plant communities
2. areas where wildlife would be irrecoverably disturbed by treatment operations.
3. areas that have succeeded to and are currently dominated by "climax" hardwoods.
4. areas where coniferous communities sensitive to treatment should be maintained.

5. areas left to develop as they are to promote the vegetational variety that existed in pre-settlement times.

The sequence of units to be treated was determined on the basis of several factors.

1. The age, health and vigor of the pioneer hardwoods now dominating the area. To reduce treatment costs and achieve the most desirable conditions for restoration it is expedient to treat the oldest, most decadent units first.
2. We have attempted to avoid treating contiguous units in successive years to create variety and avoid large blocks of treated land for aesthetic purposes.
3. Treatments have been timed to coincide with concomitant wildlife, ecological, and palynological studies.
4. Accessibility to treatment units has also been considered in the ordination.
5. Current harvesting operations in the White Earth State Forest to the west of the project area have called for some postponement in the treatment of bordering units.

The unit boundaries, sizes, ordination, and exclusion zones are not unalterable. The experience acquired during the early years of the project may suggest changes in the initial plan. Buffer zones or exclusion zones may be established or old zones altered to break up the treatment units into sub-units or to preserve newly found sensitive areas. Ecological and climatological phenomena now unforeseen may render decisions made today obsolete. Consequently, planning should not be cast in bronze, but maximum flexibility should be maintained within the basic framework.

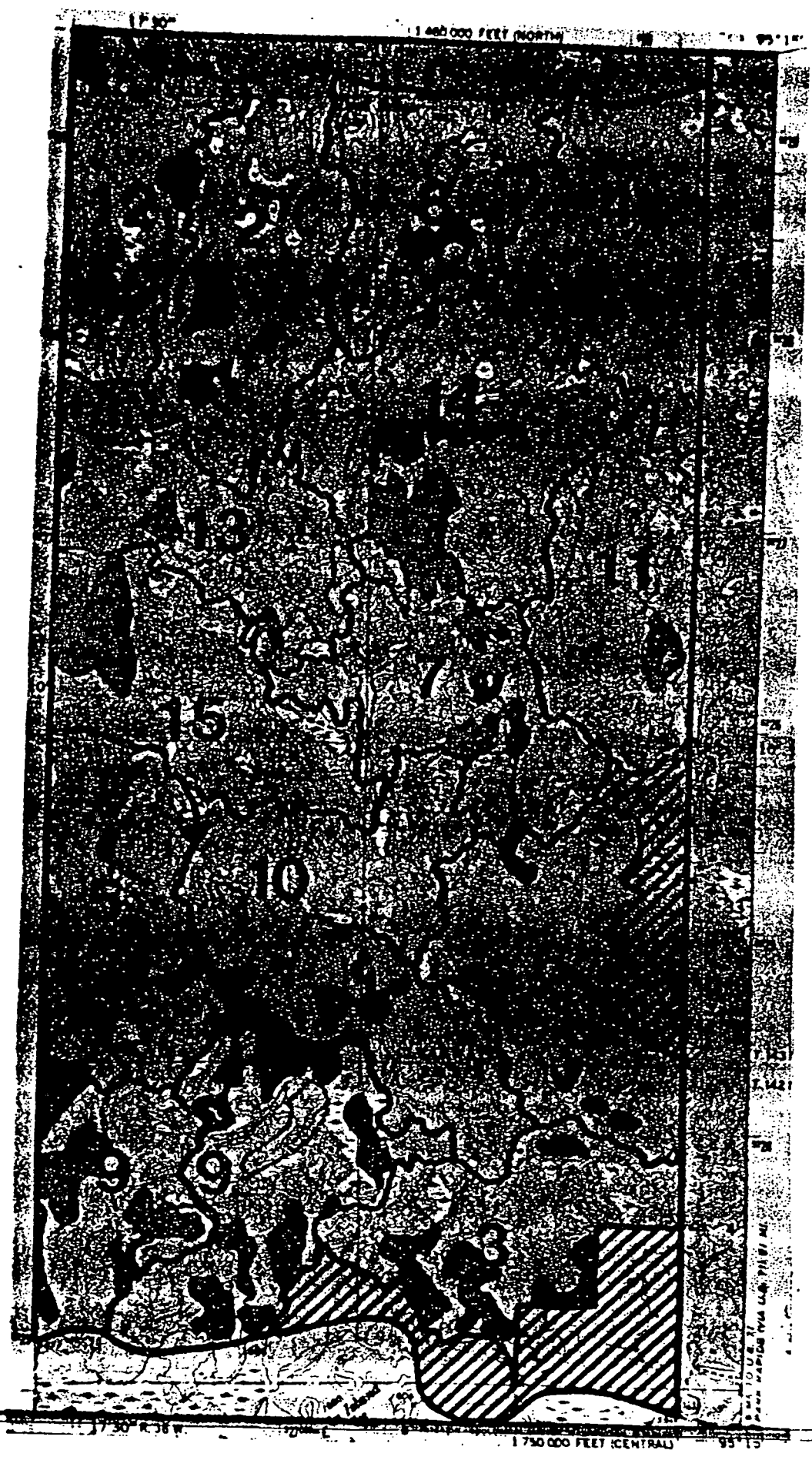


Figure 3. Treatment Units of the Development Management Zone

Treatment Restrictions

Small clearcuts of transient types will be required on sites to be reconverted to pine types. Such treatments are necessary to open the canopy for the shade-intolerant pine, for the suppression of competing vegetation, and for the reduction of fuel loads for subsequently prescribed burns. These small clearcuts and partial cuts will be conducted on approximately three-fourths of the project area (Table 1).

Cutting regulations and restrictions are designed and shall be imposed in part or entirely to best achieve the project goal and protect amenities. Compliance with restrictions and requested operations will amount to additional harvest costs for the timber operator and therefore should be discounted from stumpage fees. Discounts will be set by the appraiser and listed in the timber appraisal report.

Regulations and Restrictions:

1. Clear-cut all merchantable timber as indicated in the appraisal report;
2. Fell trees away from swamps;
3. Utilize aspen and birch to 4" top diameter or less;
4. Certain areas shall be reserved from treatment and so indicated in the appraisal report;
5. Some stumpage may be excluded after harvest operations have begun;
6. Non-merchantable trees of non-reserve species shall be cut or pushed down and flattened to facilitate burning;
7. Cutting of non-commercial stands may be required;
8. Limbing can be done where the tree is felled, but topping must be done at a convenient site and the tops pushed into piles for burning;
9. Slash shall be flattened with a skidder or the like and kept out of swamps;
10. Slash shall be removed from reserve pine stands and kept away from pine tree bases;

Table 1

Acres Treated Per Unit

Treatment Unit	Total Acres/Unit[1]	Acres Reserved	Acres Treated[2]
1	191.01	22.04	168.97
2	348.00	106.52	241.48
3	296.61	72.55	224.06
4	325.10	96.42	228.68
5	325.08	69.79	255.29
6	328.75	47.75	281.00
7	299.37	110.20	189.17
8	270.90	60.61	210.29
9	539.04	242.43	296.61
10	237.84	36.73	201.11
11	275.49	31.22	244.27
12	235.08	37.65	197.43
13	274.57	45.92	228.65
14	402.22	126.73	275.49
15	300.28	67.95	232.33
Total Acres	4649.34		
Total Reserve Acres		1174.51	
Total Treated Acres			3474.83

[1]Acreages computed from 1:24,000 U.S.G.S. Topographic Map.

[2]Treated acreages include areas to be partially cut.

11. Stumps shall not be higher than six inches from the ground, or stump heights shall be regulated for given conditions;
12. Roads: all shall be to minimum specifications:
    a) Main haul roads will be set up by the Divisions of Forestry and Parks. No deviations will be allowed without permission;
    b) Road construction debris shall be shoved well off the road and flattened. None shall be shoved into swamps or drainage ways;
    c) Roads shall be constructed so as not to impede drainage;
    d) Truck turnouts for passing will be marked out along access roads;
    e) Minor maintenance and snow removal will be the responsibility of the timber operator;
13. Timber landings will be located a minimum of 200 feet off the main haul road, according to the Forester's directions and to the minimum Division of Forestry specifications;
14. Decible maximums for equipment may be imposed;
15. Any solid waste or equipment residue must be kept picked up and a garbage can provided for this purpose;
16. Oil from equipment oil changes must be drained into a receptacle for removal from the park;
17. All buildings and equipment must be removed from the permit area within the specified 90-day period;
18. Time of day or day of week or season for cutting may be restricted;
19. If there is some doubt or question about some environmental problem, the operator is requested to contact the District Forester at the Itasca Ranger Station.

Silvicultural Treatments

The purpose of silvicultural treatments is to secure the best possible conditions for restoring the area to pre-settlement community types. These types include:

1. small, even-aged stands of red pine and jack pine;
2. stands of mixed red pine, white pine, and jack pine;
3. stands of jack pine and red pine mixed with seral hardwood species;
4. pure stands of seral hardwood species;
5. scattered white pine mixed into red pine groves;
6. white pine mixed with other seral species;
7. some limited stands of pure even-aged white pine;
8. stands of white pine scattered among mesic northern hardwoods;
9. pure northern hardwood groves;
10. upland brush;
11. lowland brush;
12. lowland conifers, etc.

It must be kept in mind that the primary purpose of treatments is neither the collection of stumpage fees nor the fulfilling of local industrial needs. Depending on the assessed value of the timber and the restrictions placed on cutting, it may be necessary to discount stumpage even to zero to obtain the desired site preparation and to protect fragile plant associations.

An overseer should be employed to aid the district forester in the enforcement of regulations during cutting, burning, and planting operations. Other duties of the overseer might be:

1. Marking treatment unit boundaries, buffer zones, control areas and sensitive areas;
2. Brushing out fire breaks;

3. Cruising and marking the next year's treatment unit;

4. Coordinating wildlife studies with treatment operations;

5. Aiding the district forester in the supervision of cutting, prescribed burns, and other treatment activities;

6. Conducting silvicultural experiments.

Pine and mesic hardwood stands may be thinned and ground fired to facilitate natural or artificial regeneration.

Birch stands on lake-side slopes may be cut or burned even if not merchantable because such sites offer good opportunities for pine regeneration. Such areas might in other cases be reserved for aesthetic purposes.

It might be advantageous to brush out some swamp and lake-side brush areas where it would be difficult to use prescribed burning.

Prescribed burning as a site preparation tool is not always successful in the Itasca area. Often conditions are too hazardous to chance a prescribed burn. At other times conditions would cause the burn to be too cool to be effective. The aspen root web in Itasca has built up to the point where it offers fatal competition with red pine and jack pine. White pine, spruce, and balsam do better in competition with aspen suckers. Thus, back-up systems of competition suppression and site preparation must be considered.

Estimated costs for the various alternatives in site preparation in 1976 dollars are:

Type of Treatment:	Cost/Acre:
Mechanical (hand tools)	$50-$75
Chopping or brush hooks	$60-$70
Clearing (D8 Caterpillar)	$40-$200
Raking	$8-$12
Burning (per burn)	$2-$4

Type of Treatment (con'd):	Cost/Acre (con'd):
Herbicide	
Aerial spray	$10-$20
Ground spray	$30-$70
Basal spray	$50-$75
Hand injection	$30-$50

Recent public concern about aerial- and ground spray-applied herbicides might make stump drench methods or individual tree injection desirable alternatives (see Addendum).

Stump treatment is used to prevent root suckering and sprouting from stumps, stubble of trees, and brush that have been recently cut. The equipment and herbicides employed are the same as those used for basal spraying (oil carriers and a brush and pail or spray unit). The radial surface and remaining bark should be saturated for best results.

Mcaffery et al. (1974) found that selective stump spraying with 2,4-DP cost $19-$22 per acre. Tordon is more expensive, but no exact per acre figures are now available.

Individual tree injection is the most effective way of eliminating undesirable hardwoods of any size. This herbicide application is ideal for use along trails and in recreation areas and gives good control of most species but is not economical for small diameter stems (J. S. Barnhart et al., 1976).

Hypo-Hatchet injections with Tordon 101 achieve 97% suppression on the average. Better success is gained on sandy soils. Costs run $30-$50 per acre or more, depending on dilution and number of stems treated per acre.

Burning costs $2-$4 per acre, but may cost as little as $0.60 per acre with student volunteers. Repeated burnings have not been given ample trial at Itasca to give a good picture of potential results. Buckman (1959) found that summer burns were better for hazel suppression. However, it is rare that summer vegetation will carry a burn. Mineral soil exposure is one benefit of site preparation by fire.

Combinations of aspen and brush suppression systems might give the best results and should be experimented with in the early years of the project.

Frequent occurrences of ten- to thirty-day summer droughts in Itasca make seeding a very chancey method of reproduction. Planting at random but in accordance with old cut stump densities will give the best results and in the long run be cheaper. With student volunteer help, costs could almost be cut in half.

Other silvicultural prescriptions will undoubtedly have to be evaluated in the near future to achieve the best possible results at the lowest possible cost.

Impact

The impacts of the described treatments on water quality and animal populations are fairly predictable. Research already conducted in Itasca State Park provides basic information. Initially, deer, grouse, and beaver populations can be expected to increase in the project area due to increases in food supply, appropriate habitat, and in the case of beaver, hutch building materials. The increased browsing impact on pine reproduction may call for increased hunting to moderate this situation. Openings and vistas created by treatment operations will make wildlife and lakes more visible to visitors.

No significant impact on water quality is expected. In a 1973 experimental clearcut of a 200-acre watershed west of Squaw Lake in Itasca State Park, no significant effects on stream flow or water quality were documented following treatment. Further, the size of the cutting areas in the 15-year plan are considerably smaller and operations considerably more restricted than in the 1973 experiment.